

Previous references.

Pat ~~1913~~ (36-23) (1-13)

1923-4
Pat)

File No. 36-23

Serial Nos. 14, 15

Later references.



GENERAL AND REVENUE SECRETARIAT

Serial Nos. 2.

Part B for Sept 24

SUBJECT

Invention no 13 of 1923-4

Serial
No.

14

From Messrs: Remfrey & Son, Calcutta
Letter of 16.9.24.

Forward 4 copies of Specification
in respect of Invention No. 137
1923-24 & advise the remittance
of Rs. 30/- required for filing the
above Specification

The firm was authorised
to file the Invention in this office
no. I. C. 126 of Part. 36.23-9 & 22.8.24
and a copy of I. C. no. I. C. 1259
of 22-8-24 was also sent

They agreed to pay the
Rs. 30/- required for filing the
Specification with their letter
of 27-8-24. (Recd. on 1-9-24)

The Specification was noti-
fied in Notice no. I. C. 178.7 of
9.9.24 & a copy sent to the firm
of ~~Notice~~ the said notification
& the original order, duly attested,
were also sent to the Company.

The spare copies received
from them were forwarded to
the Dept. concerned as per rule

Now they have again remitted
Rs. 30/- for filing the Specification
& forwarded 4 additional,

Pat File No.

36

of 19 23

General and Revenue
Secretariat.Serial
No.

A letter to the firm returning
the two excess amounts & the copies
~~of the specification~~ is put up for
approval.

23/9/24

Buy up with 2/2
sm 28/9

Issue
sm 23/9

Se 157.

To

Messrs. Ransford & Son, Calcutta

Invoice 2236 of 23/9

With reference to Se (14) Reliance
the amount. deducting money order
Commission as the order was issued
for the Specification & Reliance
orders received with their letter.

B
GEN. & REV. SECRETARY
1-OCT 1924
INDUSTRIES & COMMERCE
BRANCH

Please perform
the St. Anne
Cof. res. of
St. Anne's
in the Branch
for a while
no

15799

REGISTERED.

To

THE CONTROLLER OF PATENTS, SECY^{IN}TO THE GOVT OF MYSORE,
PATENT-GENL. & REV. DEPTS.,
CALCUTTA. BANGALORE,
MYSORE.

FROM

REMERY & SON,
PATENT & TRADE-MARK ATTORNEYS,
CALCUTTA.

Dated CALCUTTA, the 16th September 1924.

SIR,

DEPT.	P.	FILED	M.
FILE INDICATION			
Mysore Pats. (Genl)			

re MARCONI'S WIRELESS TEL:CO.LD. (MYSORE)

No. 13/23-24 dated --

J.K.Pending No. 16,179/23 dated 21/6/23)

Pursuant to the Order granting Leave in this matter dated 22/8/24, Register No. 13 of 1923-24, we have the honour to forward herewith 4 copies of the Specification duly signed by the Applicants MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED, of Marconi House, Strand, London, England, Electrical Engineers, in respect of its invention for "IMPROVEMENTS IN AERIALS FOR USE IN WIRELESS SIGNALLING"

The abovementioned Order is enclosed and we solicit the favour of your filling in the Certificate at foot thereof and having same signed.

A Post Office Order for Rs.30/-/- is sent today.

We have the honour to name our Office in Calcutta as address for service under the Act.

We have the honour to be,
Sir,
Your very obedient servants,

Enclos:-
4 Specs.
Order.

By.P.O.O:-
Rs.30/-/-.

IMB.

1530 (4)

COUPON. The remitter may write here any communication to the payee. m s to

Rs. 60/-/R.

re W.A. FRAYMOUTH.
(MYSORE)
No. 9/22-23 dated
re MARCONI'S WIRELESS TEL
CO. LTD. (MYSORE)
No. 12/23-24 dated
AGPO
re two letters
of 10/9/24.

Remitter

[Signature]

[Signature]

To 246 Branch

in
21/9/24

GEN. & REV. SECRETARY.
22 SEP 1924
INDUSTRIES & CO
BRANCH.

To be see letter me 11.13 Rs. 30/- for 12/23
21/9 9-22

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN that we, MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, of Marconi House, Strand, London, England, Electrical Engineers, are in possession of an invention for "Improvements in aerials for use in wireless signalling", and we, the said Marconi's Wireless Telegraph Company, Limited, do hereby declare the nature of the said invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say :-

This invention relates to improvements in aerials for use in wireless signalling and is particularly applicable for use with short waves.

According to the present invention an aerial is constructed of a number of vertical wires or rods spaced a fraction of a wave length apart in a plane which is at right angles to the desired direction of working. The wires or rods are connected together at the top and bottom and each rod together with the wires connecting it to the top and bottom of the next rod is in tune with the waves to be used when in its position in the aerial.

Such an aerial can be extended indefinitely without appreciably affecting the tune. By making this system of a length which is several times the wave length of the waves employed very sharp transmission or reception in a horizontal plane is obtained, the directional effect being a function of the length of the aerial relative to the wave length. Moreover, by arranging two or more such aerials or units one above another and feeding them from a common supply, sharp directional effects in the vertical plane also can be obtained.

The invention is illustrated by the accompanying diagrams. Figure 1 is a front view showing a system comprising two such units suspended from masts A A.

Figure 2 is a view to a larger scale and showing the means for feeding current to a unit for transmission. BB are vertical wires connected at their tops and bottoms by horizontal wires C D E F.

Each of the two units, as associated, is in tune in the vertical direction with the wave to be transmitted or received. The two units are coupled together electrostatically through the small condensers G. In practice the capacity between the wires D E is usually sufficient as a coupling condenser. Two, three, or more systems can be used above each other, each coupled to the one above it electrostatically, or in an equivalent manner.

Oscillations produced in any one of the units will then produce oscillations in the units above and below. The lengths of the vertical members and the coupling capacities should be so adjusted that the currents are in the same phase in each system.

Such an aerial system is capable of extension in the vertical and horizontal directions without affecting appreciably the natural tune of the aerial. If fed correctly from a transmitter the currents in all the vertical members of the aerial will all be in the same phase, and the aerial will radiate two "beams" in opposite directions, and at right angles to the plane of the aerial. The concentration of the radiation is a simple function of the dimensions of the aerial both vertically and horizontally.

It is desirable that no oscillations in the aerial in the horizontal direction should be allowed as these would represent a loss of energy. The aerial may be separated into sections, as, for instance, by breaks in the horizontal wires; or resistances H, inserted in the horizontal members will suppress any such oscillations.

In order to produce currents of substantially the same phase and intensity in all the vertical wires of such a system which is large compared with the wave length power should be fed to it at a number of points simultaneously. The feeding points should not be more than one wave length apart, and are preferably about half a wave length apart

The alternating E.M.Fs impressed at each feeding point should all be of the same phase and intensity. This result may be attained by leading a cable from each feeding point to the generator, and arranging that the length of this cable from each point to the generator is the same.

Figure 2 shows one arrangement for feeding. F is the bottom horizontal wire. J,K,L,M are equally spaced feeding points which are connected through condensers N and the secondaries of transformers P to earth or a balancing capacity. The primaries of the transformers P are all connected to a cable Q. Separate cables of equal length, or equivalent length electrically may be used, or they may be connected as shown so that the length from any transformer to the generator is the same. It is necessary for efficient working that no reflection of the oscillations transmitted through the cable by the generator should take place at the feeding points. This can be attained by arranging the ratio of the transformers so that the effective resistance of each portion of the aerial fed by the transformer as applied to the cable is equal to the critical resistance required at the cable terminals to prevent reflection. Under these conditions,

no reflections will take place, and no stationary wave effects will be produced in the cables.

Cables built up of parallel tubes or rods like a Lecher wire system and enclosed in metal conduits are best and give a very high efficiency. It is sometimes convenient to insert the transformers in the centre of the vertical portions of the aerial, and if the resistance of the aerial is equal or nearly equal to the critical resistance of the cable, the cable may be directly connected in the vertical members without having recourse to transformers. The secondaries of the transformers may also be inserted between the sections of the aerial, e.g. between the wires D and E (see figure 1).

It has been found that two aerial systems such as are illustrated in figure 1 arranged in parallel planes one behind the other and spaced a quarter wave length or an odd multiple of a quarter of a wave length apart may be used. If one is used as a transmitter the other functions as a reflector and unidirectional transmission or reception with any desired degree of concentration is obtained. In this combination the transmitting aerial may if desired be smaller in height than the reflecting aerial. As the reflecting aerial does not require any power feeding arrangements it may easily be extended vertically several wave lengths and great concentration in the vertical direction may thus be obtained. One possible arrangement is a transmitting aerial of low height compared with the wave length in combination with a reflector high compared with the wave length arranged in the form of a

cylindrical parabola with its focal line horizontal and coincident with the transmitting aerial.

As a practical indication of the dimensions and results to be obtained from such aerials as described the following are given:-

For an aerial as shown in figure 1, a practical horizontal spacing between the vertical members is $1/8$ of the wave length and for this spacing the distance between the horizontal members (i.e. the distance C.D. or E.F.) is about one third of the wave length. Using a combination of a transmitting aerial and reflecting aerial each one square wave length in area the energy radiated or received on a line at right angles to the aerial is ten times that which would be radiated or received by an ordinary aerial radiating the same total energy. Also for aerials of more than one square wave length the effect is practically proportional to the area.

An aerial of 10 square wave lengths will give 100 times the energy in the required direction, and would receive from that direction 100 times the energy received by an ordinary aerial. The combination at both the transmitting and the receiving station of aerials of 10 square wave lengths provided with reflectors will give 10,000 times the energy obtained with ordinary aerials. If the aerials are one wave length high and ten wave lengths wide practically no energy will be radiated or received outside an angle of 5° to 7° from the direction joining the station.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:-

1. An aerial for directional wireless telegraphy and telephony comprising a number of vertical rods or wires connected together by horizontal wires combined with means for simultaneously supplying oscillations in the same phase to the aerial at a number of equidistant points.

2. An aerial for directional wireless telegraphy and telephony made of a number of units assembled one above another and coupled together, each unit comprising a number of vertical rods or wires connected together by horizontal wires, substantially as described.

3. An aerial according to claim 1 or 2 and having resistances inserted at points along the horizontal connecting wires to prevent oscillations taking place in the aerial in the horizontal direction while allowing oscillations in the vertical direction.

4. The combination of an aerial according to claim 2 or 3 with a cable feeder system for simultaneously supplying oscillations in the same phase to a number of equidistant points in the aerial.

5. The combination of two aerials as described in any of the preceding claims, arranged parallel to one another, one aerial acting as a transmitting aerial, and the other as a reflecting aerial for the purpose of obtaining unidirectional working as described.

6. The combination of an aerial as described in claims 1, 2, 3 and 4, and a similar aerial without any

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feeder system as a reflector, the reflecting aerial being of the same size or larger than the transmitting aerial.

7. An aerial according to any of the preceding claims in which each rod together with the wires connecting it to the top and bottom of the next rod is when in position in the aerial in tune with the waves to be used.

Dated this 13th day of May 1924.

MARCONI'S WIRELESS TELEGRAPH COMPANY,
LIMITED,

by its constituted Attorneys

A handwritten signature in cursive script, likely of an attorney, written in dark ink.

Fig. 1

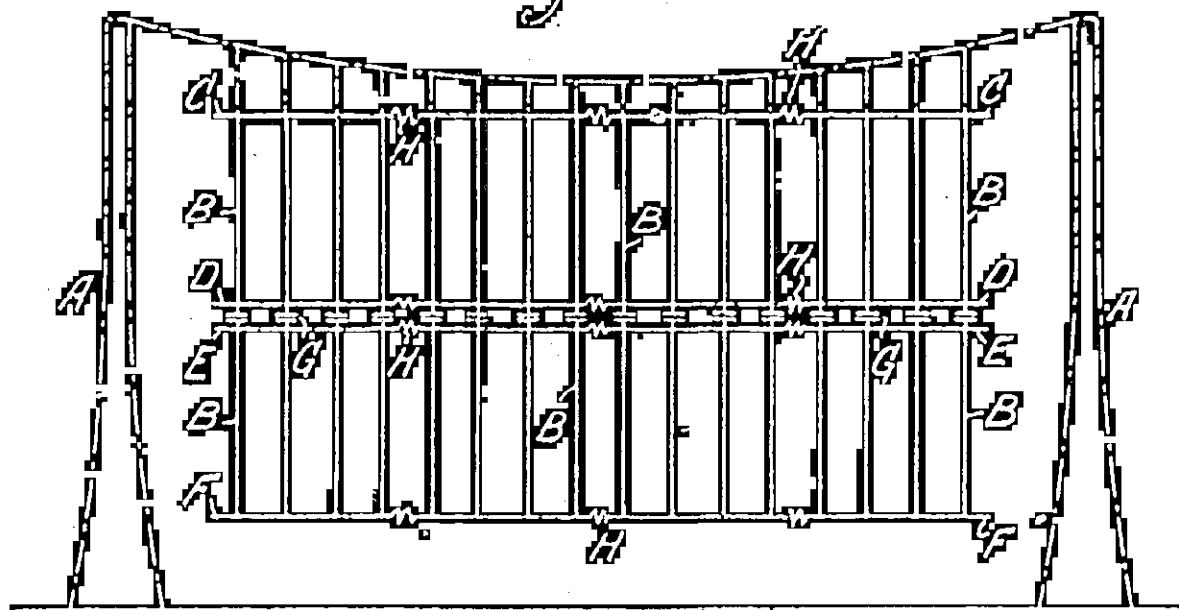
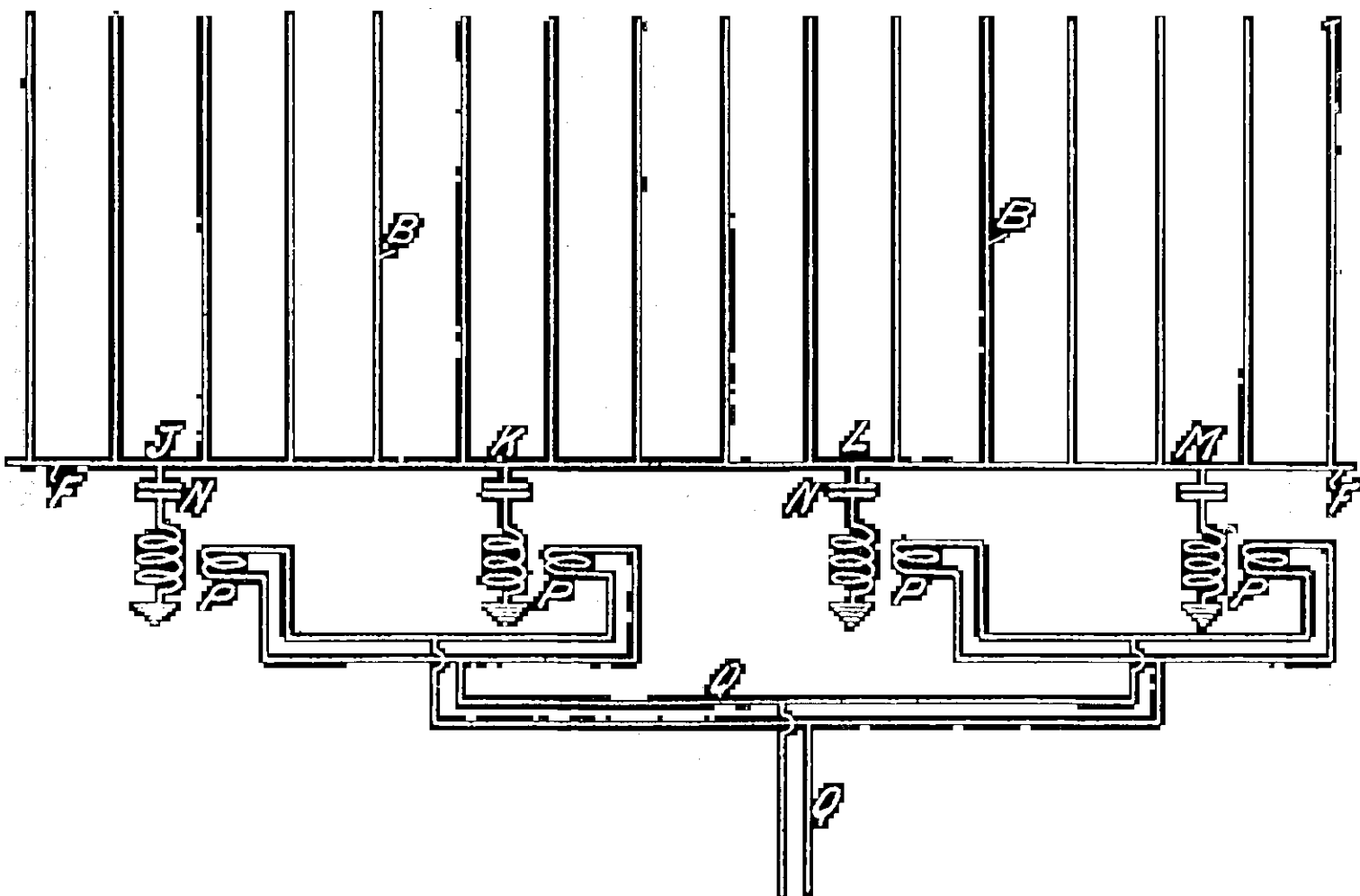


Fig. 2.



SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

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This invention relates to improvements in aerials for use in wireless signalling and is particularly applicable for use with short waves.

According to the present invention an aerial is constructed of a number of vertical wires or rods spaced a fraction of a wave length apart in a plane which is at right angles to the desired direction of working. The wires or rods are connected together at the top and bottom and each rod together with the wires connecting it to the top and bottom of the next rod is in tune with the waves to be used when in its position in the aerial.

Such an aerial can be extended indefinitely without appreciably affecting the tune. By making this system of a length which is several times the wave length of the waves employed very sharp transmission or reception in a horizontal plane is obtained, the directional effect being a function of the length of the aerial relative to the wave length. Moreover, by arranging two or more such aerials or units one above another and feeding them from a common supply, sharp directional effects in the vertical plane also can be obtained.

The invention is illustrated by the accompanying diagrams. Figure 1 is a front view showing a system comprising two such units suspended from masts A A.

Figure 2 is a view to a larger scale and showing the means for feeding current to a unit for transmission. BB are vertical wires connected at their tops and bottoms by horizontal wires C D E F.

Each of the two units, as associated, is in tune in the vertical direction with the wave to be transmitted or received. The two units are coupled together electrostatically through the small condensers G. In practice the capacity between the wires D E is usually sufficient as a coupling condenser. Two, three, or more systems can be used above each other, each coupled to the one above it electrostatically, or in an equivalent manner.

Oscillations produced in any one of the units will then produce oscillations in the units above and below. The lengths of the vertical members and the coupling capacities should be so adjusted that the currents are in the same phase in each system.

Such an aerial system is capable of extension in the vertical and horizontal directions without affecting appreciably the natural tune of the aerial. If fed correctly from a transmitter the currents in all the vertical members of the aerial will all be in the same phase, and the aerial will radiate two "beams" in opposite directions, and at right angles to the plane of the aerial. The concentration of the radiation is a simple function of the dimensions of the aerial both vertically and horizontally.

It is desirable that no oscillations in the aerial in the horizontal direction should be allowed as these would represent a loss of energy. The aerial may be separated into sections, as, for instance, by breaks in the horizontal wires; or resistances H, inserted in the horizontal members will suppress any such oscillations.

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In order to produce currents of substantially the same phase and intensity in all the vertical wires of such a system which is large compared with the wave length power should be fed to it at a number of points simultaneously. The feeding points should not be more than one wave length apart, and are preferably about half a wave length apart

The alternating E.M.Fs impressed at each feeding point should all be of the same phase and intensity. This result may be attained by leading a cable from each feeding point to the generator, and arranging that the length of this cable from each point to the generator is the same.

Figure 2 shows one arrangement for feeding. F is the bottom horizontal wire. J,K,L,M are equally spaced feeding points which are connected through condensers N and the secondaries of transformers P to earth or a balancing capacity. The primaries of the transformers P are all connected to a cable Q. Separate cables of equal length, or equivalent length electrically may be used, or they may be connected as shown so that the length from any transformer to the generator is the same. It is necessary for efficient working that no reflection of the oscillations transmitted through the cable by the generator should take place at the feeding points. This can be attained by arranging the ratio of the transformers so that the effective resistance of each portion of the aerial fed by the transformer as applied to the cable is equal to the critical resistance required at the cable terminals to prevent reflection. Under these conditions,

no reflections will take place, and no stationary wave effects will be produced in the cables.

Cables built up of parallel tubes or rods like a Lecher wire system and enclosed in metal conduits are best and give a very high efficiency. It is sometimes convenient to insert the transformers in the centre of the vertical portions of the aerial, and if the resistance of the aerial is equal or nearly equal to the critical resistance of the cable, the cable may be directly connected in the vertical members without having recourse to transformers. The secondaries of the transformers may also be inserted between the sections of the aerial, e.g. between the wires D and E (see figure 1).

It has been found that two aerial systems such as are illustrated in figure 1 arranged in parallel planes one behind the other and spaced a quarter wave length or an odd multiple of a quarter of a wave length apart may be used. If one is used as a transmitter the other functions as a reflector and unidirectional transmission or reception with any desired degree of concentration is obtained. In this combination the transmitting aerial may if desired be smaller in height than the reflecting aerial. As the reflecting aerial does not require any power feeding arrangements it may easily be extended vertically several wave lengths and great concentration in the vertical direction may thus be obtained. One possible arrangement is a transmitting aerial of low height compared with the wave length in combination with a reflector high compared with the wave length arranged in the form of a

cylindrical parabola with its focal line horizontal and coincident with the transmitting aerial.

As a practical indication of the dimensions and results to be obtained from such aerials as described the following are given:-

For an aerial as shown in figure 1, a practical horizontal spacing between the vertical members is $1/8$ of the wave length and for this spacing the distance between the horizontal members (i.e. the distance C.D. or E.F.) is about one third of the wave length. Using a combination of a transmitting aerial and reflecting aerial each one square wave length in area the energy radiated or received on a line at right angles to the aerial is ten times that which would be radiated or received by an ordinary aerial radiating the same total energy. Also for aerials of more than one square wave length the effect is practically proportional to the area.

An aerial of 10 square wave lengths will give 100 times the energy in the required direction, and would receive from that direction 100 times the energy received by an ordinary aerial. The combination at both the transmitting and the receiving station of aerials of 10 square wave lengths provided with reflectors will give 10,000 times the energy obtained with ordinary aerials. If the aerials are one wave length high and ten wave lengths wide practically no energy will be radiated or received outside an angle of 5° to 7° from the direction joining the station.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:-

1. An aerial for directional wireless telegraphy and telephony comprising a number of vertical rods or wires connected together by horizontal wires combined with means for simultaneously supplying oscillations in the same phase to the aerial at a number of equidistant points.

2. An aerial for directional wireless telegraphy and telephony made of a number of units assembled one above another and coupled together, each unit comprising a number of vertical rods or wires connected together by horizontal wires, substantially as described.

3. An aerial according to claim 1 or 2 and having resistances inserted at points along the horizontal connecting wires to prevent oscillations taking place in the aerial in the horizontal direction while allowing oscillations in the vertical direction.

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5. The combination of two aerials as described in any of the preceding claims, arranged parallel to one another, one aerial acting as a transmitting aerial, and the other as a reflecting aerial for the purpose of obtaining unidirectional working as described.

6. The combination of an aerial as described in claims 1, 2, 3 and 4, and a similar aerial without any

feeder system as a reflector, the reflecting aerial being of the same size or larger than the transmitting aerial.

7. An aerial according to any of the preceding claims in which each rod together with the wires connecting it to the top and bottom of the next rod is when in position in the aerial in tune with the waves to be used.

Dated this 13th day of May 1926

Marconi's Wireless Telegraph Coy Ltd
by its consolidated attorneys

John V. S. Son

Fig. 1.

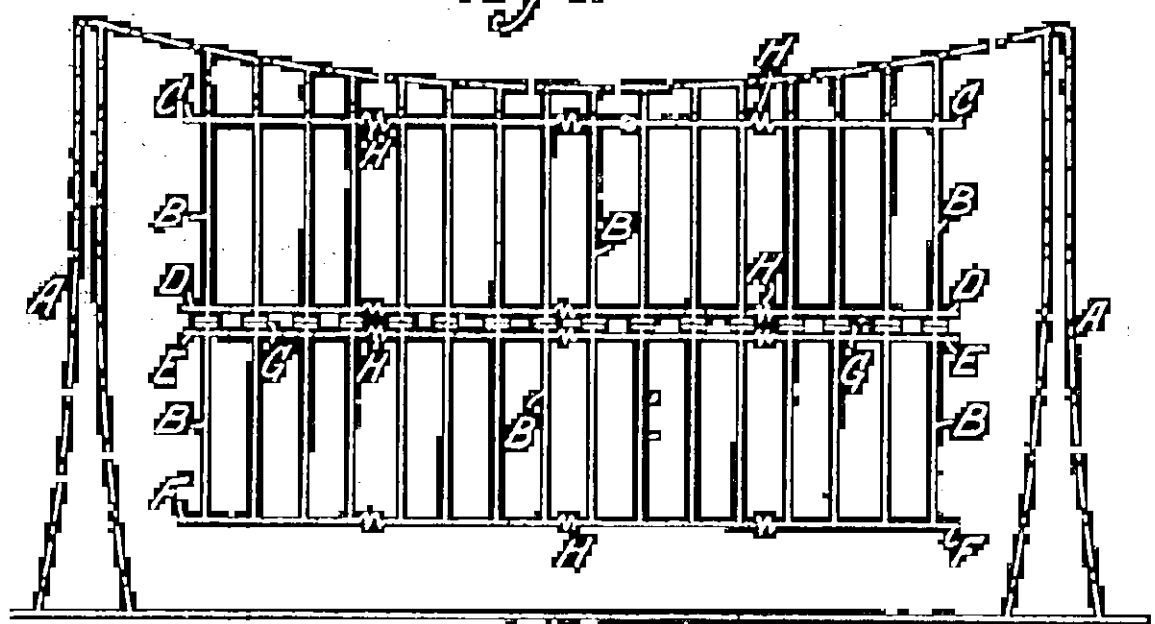
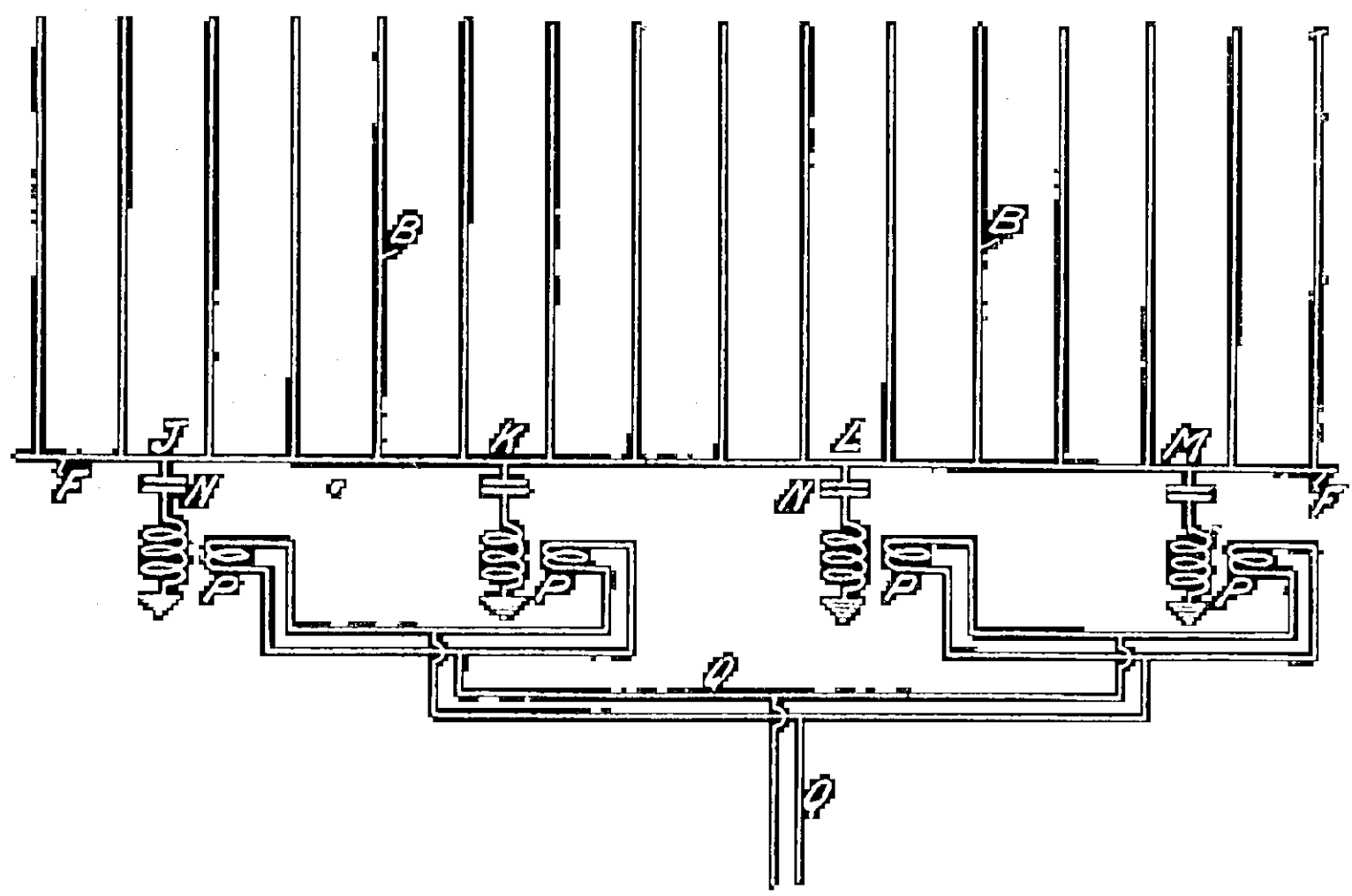


Fig. 2.



SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN that we, MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, of Marconi House, Strand, London, England, Electrical Engineers, are in possession of an invention for "Improvements in aerials for use in wireless signalling", and we, the said Marconi's Wireless Telegraph Company, Limited, do hereby declare the nature of the said invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say:-

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The invention is illustrated by the accompanying diagrams. Figure 1 is a front view showing a system comprising two such units suspended from masts A A.

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Each of the two units, as associated, is in tune in the vertical direction with the wave to be transmitted or received. The two units are coupled together electrostatically through the small condensers G. In practice the capacity between the wires D E is usually sufficient as a coupling condenser. Two, three, or more systems can be used above each other, each coupled to the one above it electrostatically, or in an equivalent manner.

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In order to produce currents of substantially the same phase and intensity in all the vertical wires of such a system which is large compared with the wave length power should be fed to it at a number of points simultaneously. The feeding points should not be more than one wave length apart, and are preferably about half a wave length apart.

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no reflections will take place, and no stationary wave effects will be produced in the cables.

Cables built up of parallel tubes or rods like a Lecher wire system and enclosed in metal conduits are best and give a very high efficiency. It is sometimes convenient to insert the transformers in the centre of the vertical portions of the aerial, and if the resistance of the aerial is equal or nearly equal to the critical resistance of the cable, the cable may be directly connected in the vertical members without having recourse to transformers. The secondaries of the transformers may also be inserted between the sections of the aerial, e.g. between the wires D and E (see figure 1).

It has been found that two aerial systems such as are illustrated in figure 1 arranged in parallel planes one behind the other and spaced a quarter wave length or an odd multiple of a quarter of a wave length apart may be used. If one is used as a transmitter the other functions as a reflector and unidirectional transmission or reception with any desired degree of concentration is obtained. In this combination the transmitting aerial may if desired be smaller in height than the reflecting aerial. As the reflecting aerial does not require any power feeding arrangements it may easily be extended vertically several wave lengths and great concentration in the vertical direction may thus be obtained. One possible arrangement is a transmitting aerial of low height compared with the wave length in combination with a reflector high compared with the wave length arranged in the form of a

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cylindrical parabola with its focal line horizontal and coincident with the transmitting aerial.

As a practical indication of the dimensions and results to be obtained from such aerials as described the following are given:-

For an aerial as shown in figure 1, a practical horizontal spacing between the vertical members is $1/8$ of the wave length and for this spacing the distance between the horizontal members (i.e. the distance C.D. or E.F.) is about one third of the wave length. Using a combination of a transmitting aerial and reflecting aerial each one square wave length in area the energy radiated or received on a line at right angles to the aerial is ten times that which would be radiated or received by an ordinary aerial radiating the same total energy. Also for aerials of more than one square wave length the effect is practically proportional to the area.

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Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:-

1. An aerial for directional wireless telegraphy and telephony comprising a number of vertical rods or wires connected together by horizontal wires combined with means for simultaneously supplying oscillations in the same phase to the aerial at a number of equidistant points.

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7. An aerial according to any of the preceding claims in which each rod together with the wires connecting it to the top and bottom of the next rod is when in position in the aerial in tune with the waves to be used.

Dated this 13th day of May 1924



Common Seal of Marconi's Wireless
Telegraph Company, Limited was hereto
affixed in the presence of

Alfred Marconi
Sir J. H. Stanger
Edge

Fig. 1

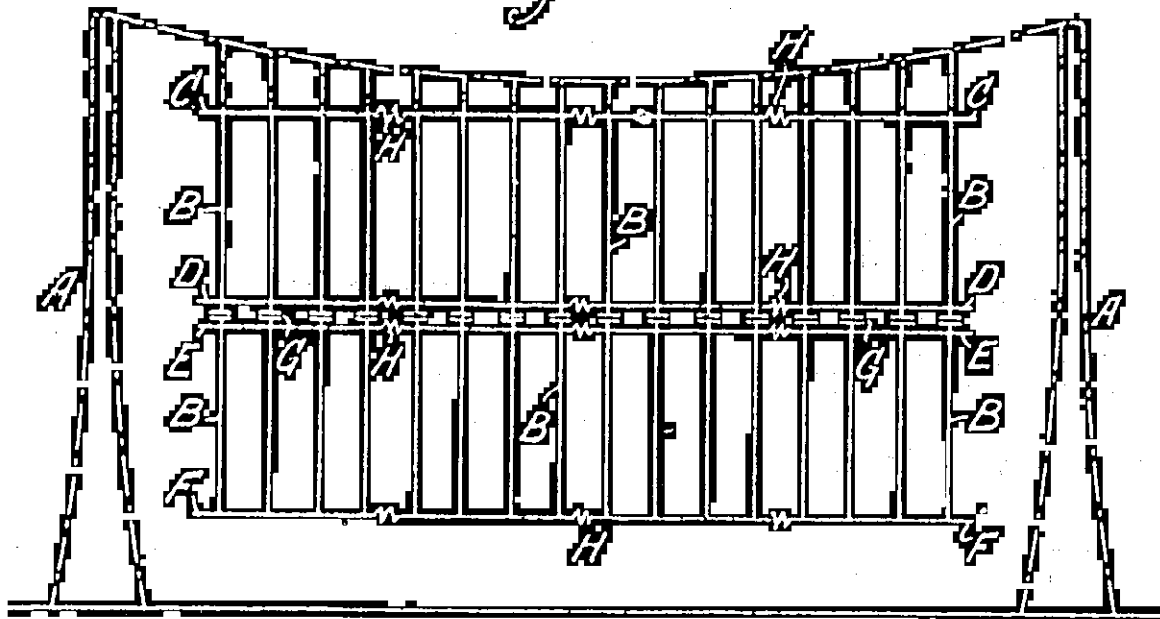
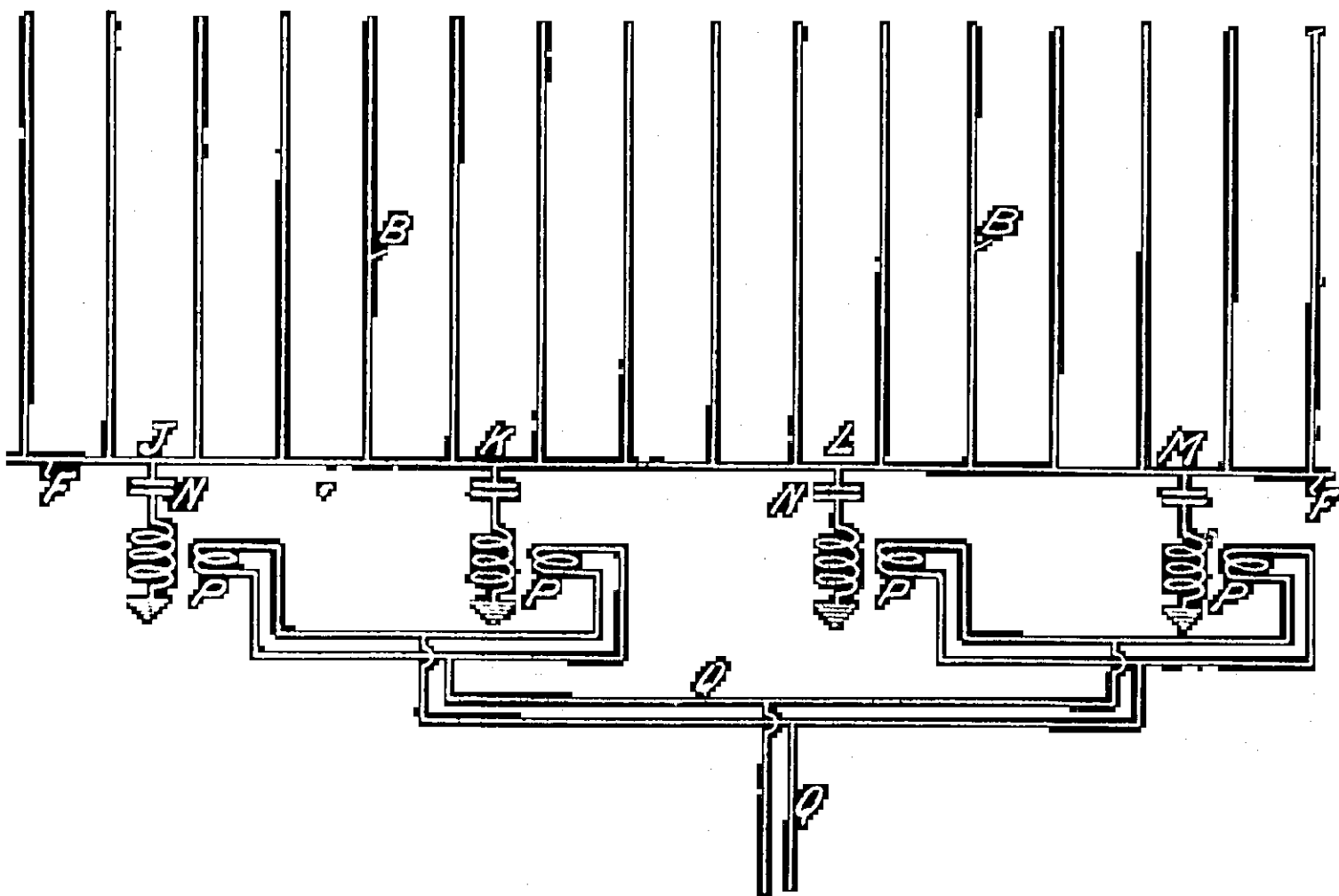


Fig. 2



SPECIFICATION

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BE IT KNOWN that we, MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, of Marconi House, Strand, London, England Electrical Engineers, are in possession of an invention for "Improvements in aerials for use in wireless signalling", and we, the said Marconi's Wireless Telegraph Company, Limited, do hereby declare the nature of the said invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say:-

This invention relates to improvements in aerials for use in wireless signalling and is particularly applicable for use with short waves.

According to the present invention an aerial is constructed of a number of vertical wires or rods spaced a fraction of a wave length apart in a plane which is at right angles to the desired direction of working. The wires or rods are connected together at the top and bottom and each rod together with the wires connecting it to the top and bottom of the next rod is in tune with the waves to be used when in its position in the aerial.

Such an aerial can be extended indefinitely without appreciably affecting the tune. By making this system of a length which is several times the wave length of the waves employed very sharp transmission or reception in a horizontal plane is obtained, the directional effect being a function of the length of the aerial relative to the wave length. Moreover, by arranging two or more such aerials or units one above another and feeding them from a common supply, sharp directional effects in the vertical plane also can be obtained.

The invention is illustrated by the accompanying diagrams. Figure 1 is a front view showing a system comprising two such units suspended from masts A A.

Figure 2 is a view to a larger scale and showing the means for feeding current to a unit for transmission. BB are vertical wires connected at their tops and bottoms by horizontal wires C D E F.

Each of the two units, as associated, is in tune in the vertical direction with the wave to be transmitted or received. The two units are coupled together electrostatically through the small condensers G. In practice the capacity between the wires D E is usually sufficient as a coupling condenser. Two, three, or more systems can be used above each other, each coupled to the one above it electrostatically, or in an equivalent manner.

Oscillations produced in any one of the units will then produce oscillations in the units above and below. The lengths of the vertical members and the coupling capacities should be so adjusted that the currents are in the same phase in each system.

Such an aerial system is capable of extension in the vertical and horizontal directions without affecting appreciably the natural tune of the aerial. If fed correctly from a transmitter the currents in all the vertical members of the aerial will all be in the same phase, and the aerial will radiate two "beams" in opposite directions, and at right angles to the plane of the aerial. The concentration of the radiation is a simple function of the dimensions of the aerial both vertically and horizontally.

It is desirable that no oscillations in the aerial in the horizontal direction should be allowed as these would represent a loss of energy. The aerial may be separated into sections, as, for instance, by breaks in the horizontal wires; or resistances H, inserted in the horizontal members will suppress any such oscillations.

In order to produce currents of substantially the same phase and intensity in all the vertical wires of such a system which is large compared with the wave length power should be fed to it at a number of points simultaneously. The feeding points should not be more than one wave length apart, and are preferably about half a wave length apart.

The alternating E.M.Fs impressed at each feeding point should all be of the same phase and intensity. This result may be attained by leading a cable from each feeding point to the generator, and arranging that the length of this cable from each point to the generator is the same.

Figure 2 shows one arrangement for feeding. F is the bottom horizontal wire. J, K, L, M are equally spaced feeding points which are connected through condensers N and the secondaries of transformers P to earth or a balancing capacity. The primaries of the transformers P are all connected to a cable Q. Separate cables of equal length, or equivalent length electrically may be used, or they may be connected as shown so that the length from any transformer to the generator is the same. It is necessary for efficient working that no reflection of the oscillations transmitted through the cable by the generator should take place at the feeding points. This can be attained by arranging the ratio of the transformers so that the effective resistance of each portion of the aerial fed by the transformer as applied to the cable is equal to the critical resistance required at the cable terminals to prevent reflection. Under these conditions,

no reflections will take place, and no stationary wave effects will be produced in the cables.

Cables built up of parallel tubes or rods like a Lecher wire system and enclosed in metal conduits are best and give a very high efficiency. It is sometimes convenient to insert the transformers in the centre of the vertical portions of the aerial, and if the resistance of the aerial is equal or nearly equal to the critical resistance of the cable, the cable may be directly connected in the vertical members without having recourse to transformers. The secondaries of the transformers may also be inserted between the sections of the aerial, e.g. between the wires D and E (see figure 1).

It has been found that two aerial systems such as are illustrated in figure 1 arranged in parallel planes one behind the other and spaced a quarter wave length or an odd multiple of a quarter of a wave length apart may be used. If one is used as a transmitter the other functions as a reflector and unidirectional transmission or reception with any desired degree of concentration is obtained. In this combination the transmitting aerial may if desired be smaller in height than the reflecting aerial. As the reflecting aerial does not require any power feeding arrangements it may easily be extended vertically several wave lengths and great concentration in the vertical direction may thus be obtained. One possible arrangement is a transmitting aerial of low height compared with the wave length in combination with a reflector high compared with the wave length arranged in the form of a

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cylindrical parabola with its focal line horizontal and coincident with the transmitting aerial.

As a practical indication of the dimensions and results to be obtained from such aerials as described the following are given:-

For an aerial as shown in figure 1, a practical horizontal spacing between the vertical members is $1/8$ of the wave length and for this spacing the distance between the horizontal members (i.e. the distance C.D. or E.F.) is about one third of the wave length. Using a combination of a transmitting aerial and reflecting aerial each one square wave length in area the energy radiated or received on a line at right angles to the aerial is ten times that which would be radiated or received by an ordinary aerial radiating the same total energy. Also for aerials of more than one square wave length the effect is practically proportional to the area.

An aerial of 10 square wave lengths will give 100 times the energy in the required direction, and would receive from that direction 100 times the energy received by an ordinary aerial. The combination at both the transmitting and the receiving station of aerials of 10 square wave lengths provided with reflectors will give 10,000 times the energy obtained with ordinary aerials. If the aerials are one wave length high and ten wave lengths wide practically no energy will be radiated or received outside an angle of 5° to 7° from the direction joining the station.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:-

1. An aerial for directional wireless telegraphy and telephony comprising a number of vertical rods or wires connected together by horizontal wires combined with means for simultaneously supplying oscillations in the same phase to the aerial at a number of equidistant points.

2. An aerial for directional wireless telegraphy and telephony made of a number of units assembled one above another and coupled together, each unit comprising a number of vertical rods or wires connected together by horizontal wires, substantially as described.

3. An aerial according to claim 1 or 2, and having resistances inserted at points along the horizontal connecting wires to prevent oscillations taking place in the aerial in the horizontal direction while allowing oscillations in the vertical direction.

4. The combination of an aerial according to claim 2 or 3 with a cable feeder system for simultaneously supplying oscillations in the same phase to a number of equidistant points in the aerial.

5. The combination of two aerials as described in any of the preceding claims, arranged parallel to one another, one aerial acting as a transmitting aerial, and the other as a reflecting aerial for the purpose of obtaining unidirectional working as described.

6. The combination of an aerial as described in claims 1, 2, 3 and 4, and a similar aerial without any

feeder system as a reflector, the reflecting aerial being of the same size or larger than the transmitting aerial.

7 An aerial according to any of the preceding claims in which each rod together with the wires connecting it to the top and bottom of the next rod is when in position in the aerial in tune with the waves to be used.

Dated this 13th day of May 1924



Common Seal of Marconi's Wireless
Telegraph Company Limited was hereto
affixed in the presence of

Alfred Marconi
.....
James S. Smith
.....
Adde
.....

Directors.
Secretary.

Fig. 1.

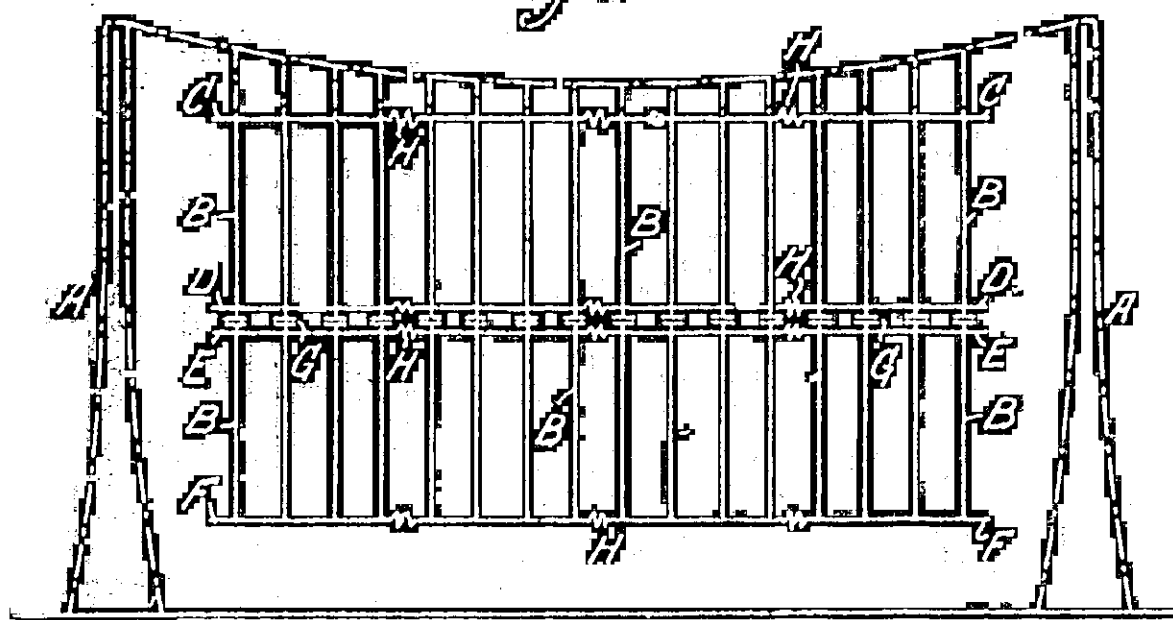
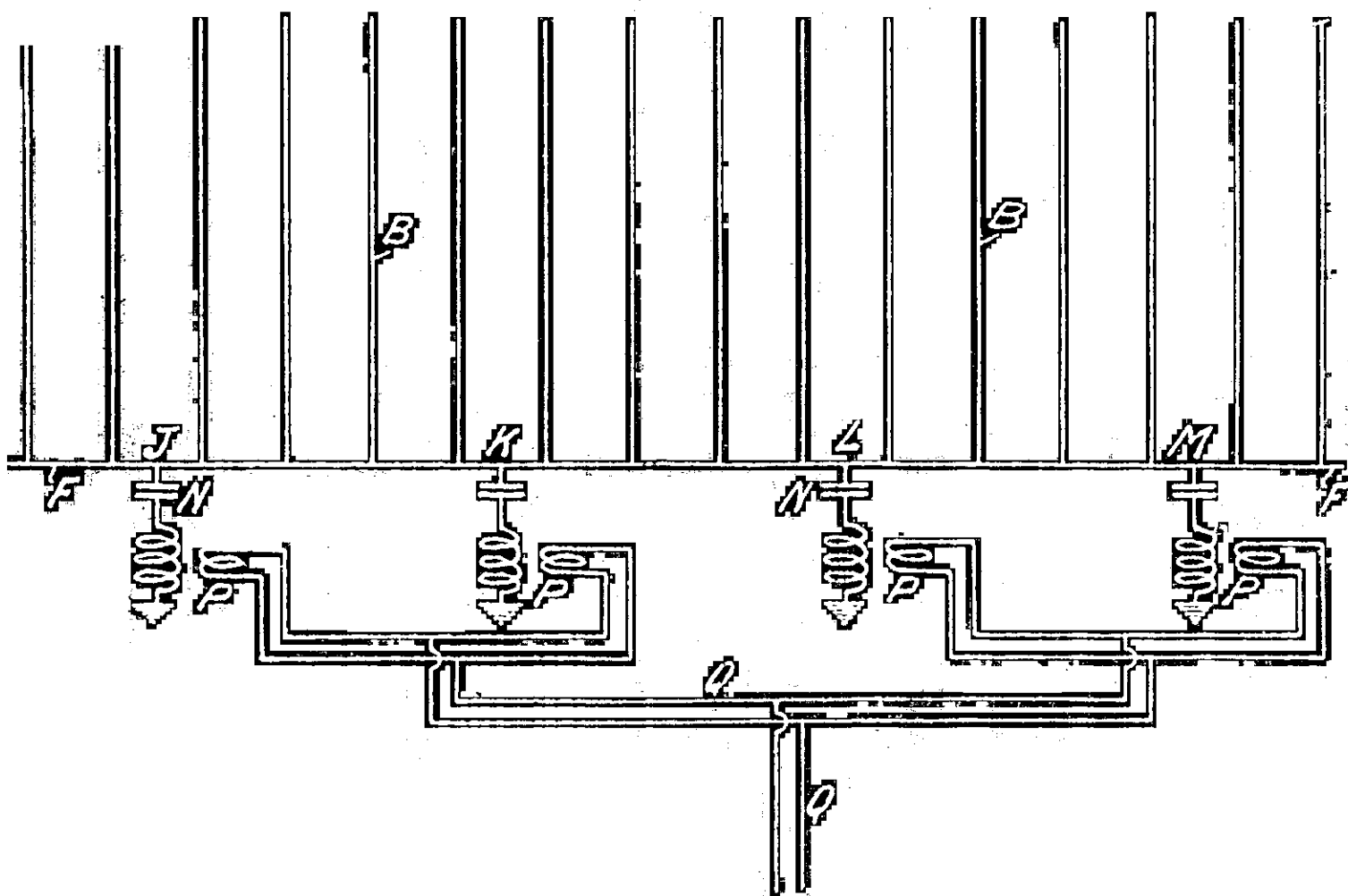


Fig. 2.



Note

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SUBJECT

B50-WD 0527

Diary No. of letter replied to

1560

Section

Pat

File No.

36-23

Serial No.

15

General and Revenue Secretariat

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No.

1.C 2286/86

Date of issue

25/9/24

To

Messrs. Rempsey & Son
Calcutta

Signed by

J. S. Narayana Rao

Gentlemen,

With reference to your letter dated 16th instant, remitting Rs. 30/- for filing the specification in respect of invention no. 13-23 for improvements in acrials for use in ~~radio~~ wireless signalling of Marconi Wireless Telegraph Co. Ltd London. I am directed to state that ~~enclosed~~ ~~attention~~ ~~is~~ that it is only on receipt of the said amount with your letter dated 27-8-24 ~~the sum~~ over

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~~returned herewith~~ for reference

Yours faithfully

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